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SOLAR OBSERVATIONS

SOLAR AND SKY RADIATION MEASUREMENTS DURING DECEMBER, 1924

By HERBERT H. KIMBALL, In Charge, Solar Radiation Investigations

For a description of instruments and exposures and an account of the method of obtaining and reducing the measurements, the reader is referred to the REVIEW for January and February, 1924, 52:42 & 113.

From Table 1 it is seen that solar radiation intensities averaged close to normal values at all three stations.

Table 2 shows that the total solar and sky radiation received on a horizontal surface averaged below normal at the three stations for which normals have been computed. For the year, Washington received an average amount of radiation, Madison 6 per cent less than the average, and Lincoln 13 1/4 per cent more than the average.

Skylight polarization measurements made on four days at Washington give a mean of 55 per cent with a maximum of 56 per cent on the 2d. These are below the corresponding averages for December at Washington. At Madison a measurement of 67 per cent on the 13th, with patches of snow on the ground, was below the average value for December at that station. After that date the ground was covered with snow.

TABLE 1.—Solar radiation intensities during December, 1924

(Gram-calories per minute per square centimeter of normal surface)

Washington, D. C.

Date	8 a.m.	Sun's zenith distance									Noon	
		78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°		
		Air mass										Local mean solar time
		A. M.					P. M.					
		e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0		
Dec. 2.....	mm.	2.16	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.	
9.....		4.75	0.62	0.76	0.92	1.12	-----	0.91	0.77	0.66	2.36	
12.....		4.75	0.85	0.96	1.17	1.31	-----	1.20	1.07	0.95	3.81	
13.....		3.81	0.64	0.78	-----	1.09	-----	1.05	-----	-----	4.17	
19.....		5.56	-----	-----	1.26	-----	-----	-----	-----	-----	5.17	
26.....		7.57	-----	-----	1.01	-----	-----	0.81	-----	-----	8.81	
Means.....		1.19	-----	1.06	1.20	1.35	-----	1.13	0.99	0.88	1.45	
Departures.....		-----	-0.70	0.89	1.10	1.19	-----	1.02	0.94	0.83	-----	
		-----	-0.08	±0.00	+0.05	-0.03	-----	+0.01	+0.05	+0.05	-----	

Madison, Wis.

Dec.		Sun's zenith distances										
		78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°		
		Air mass										
		A. M.					P. M.					
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.	
1.....	mm.	1.78	-----	-----	-----	-----	-----	1.01	-----	-----	1.88	
2.....	cal.	2.06	-----	0.88	-----	-----	-----	-----	-----	-----	3.45	
10.....		1.07	-----	1.00	1.17	-----	-----	-----	-----	-----	1.52	
13.....		3.45	1.04	-----	1.32	-----	-----	-----	-----	-----	1.96	
19.....		0.88	-----	-----	-----	-----	-----	1.29	-----	-----	0.51	
20.....		0.43	-----	1.19	1.29	-----	-----	-----	-----	-----	0.56	
22.....		0.79	-----	0.97	1.15	-----	-----	-----	-----	-----	0.56	
24.....		0.58	-----	-----	1.34	-----	-----	-----	-----	-----	1.02	
Means.....		(1.04)	1.01	1.25	-----	-----	-----	(1.15)	-----	-----	-----	
Departures.....		+0.08	-0.09	+0.02	-----	-----	-----	-0.14	-----	-----	-----	

* Extrapolated.

TABLE 1.—*Solar radiation intensities during December 1924—Con.*
Lincoln, Nebr.

(Gram-calories per minute per square centimeter of normal surface)

Date	8 a.m.	Sun's zenith distance										Noon	
		78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°			
		Air mass											
		A. M.						P. M.					
		e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0		e.
Dec. 1	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.		
9	1.52	1.01	1.12	1.25				1.22			2.49		
15	3.00	0.88	0.97	1.14							1.96		
19	0.63							1.35	1.17		4.57		
22	0.96							1.08			0.64		
Means		(0.94)	(1.04)	(1.20)				1.22	(1.17)		1.12		
Departures		±0.00	-0.01	-0.03				+0.02	+0.10				

* Extrapolated.

TABLE 2.—*Solar and sky radiation received on a horizontal surface*

(Gram-calories per square centimeter of horizontal surface)

Week beginning—	Average daily radiation					Average daily departure from normal		
	Washington	Madison	Lincoln	Chicago	New York	Washington	Madison	Lincoln
Dec. 3.....	cal. 90	cal. 67	cal. 104	cal. 57	cal. 94	cal. -57	cal. -54	cal. -72
10.....	146	115	157	73	85	+3	-9	-16
17.....	134	148	143	56	87	-9	+21	-31
24 *.....	121	153	168	83	110	-25	+21	-11
Excess or deficiency since first of year on Dec. 31, 1924.....						-6	-7402	+2445

* For eight days.

551. 5°6 (261.1) WEATHER OF NORTH AMERICA AND ADJACENT OCEANS

NORTH ATLANTIC OCEAN

By F. A. YOUNG

The following table shows the average sea-level pressure for the month at a number of land stations on the coast and islands of the North Atlantic. The readings are for 8 a. m., 75th meridian time, and the departures are only approximate, as the normals were taken from the Pilot Chart and are based on Greenwich mean noon observations, which correspond to those taken at 7 a. m., 75th meridian time.

Stations	Average pressure	Departure
	Inches	Inches
St. Johns, Newfoundland.....	29.70	-0.18
Nantucket.....	30.11	+0.04
Hatteras.....	30.21	+0.06
Key West.....	30.14	+0.05
New Orleans.....	30.19	+0.07
Swan Island.....	29.98	-0.01
Turks Island.....	30.13	+0.10
Bermuda.....	30.28	+0.14
Horta, Azores.....	30.22	+0.11
Lerwick, Shetland Islands.....	29.52	-0.26
Valencia, Ireland.....	29.74	-0.21
London.....	29.99	-0.02

The average pressure at Horta being somewhat above normal, while at Lerwick it was considerably below, denotes that the Azores high and Icelandic low were well developed with a steep gradient between the two centers of action. At Horta the barometric readings ranged from 29.64 inches on the 20th to 30.52 inches on the 24th, and at Lerwick from 28.35 inches on the 27th to 30.18 inches on the 21st.

In each month from September to December, 1924, inclusive, the number of days with winds of gale force over the steamer lanes was greater than the normal as shown on the Pilot Chart. The maximum number of stormy days was reached in the month under discussion, when in the region between the 45th and 50th parallels and the 25th and 45th meridians gales were reported on from 12 to 14 days. These conditions are abnormal even for December, which, with the exception of January, is considered the stormiest month of the year over the North Atlantic.

Judging from reports received, the number of days with fog was somewhat less than usual over the Grand Banks; it apparently occurred with about its normal frequency off the American coast and somewhat above in northern European waters, while the steamer lanes were comparatively free. Fog was also reported on two

days in the western part of the Gulf of Mexico, two days off the coast of Portugal, and one day in the vicinity of the Azores.

From the 1st to 3d there were two well-developed disturbances in northern waters; the first central in the vicinity of Newfoundland and the second off the coast of northern Europe. The storm area of the western low extended as far south as the 35th parallel, while on the 1st and 2d the eastern disturbance was restricted to the region between the 45th and 50th parallels and the 15th and 25th meridians. According to reports received this latter storm was intermittent in character, with a period of comparatively moderate weather between the heavy winds occurring at the time of observation on the 1st and 2d, and was recorded by some observers as two separate gales. On the 1st winds of gale force were also reported by vessels about midway between these two lows. On the 4th the western disturbance was central near 50° N., 35° W.; it moved rapidly eastward and on the 5th was near 50° N., 20° W. On both dates strong westerly gales prevailed in the southerly quadrants.

On the 5th St. Johns, Newfoundland, was near the center of another depression, that by the 7th was central near 45° N., 40° W.; it then apparently curved sharply northeastward, although the position on the 8th was uncertain, due to lack of observations.

On the 5th and 6th the trade winds were unusually well developed over the region between the Canal Zone and Jamaica, as shown by storm report in table.

On the 9th a depression covered the province of Quebec; this moved eastward increasing in intensity, and on the 11th the center was near 50° N., 35° W., and by the 12th about 15° west of the coast of Scotland. Moderate to strong gales prevailed on both of these dates in mid-ocean, and on the 12th southerly winds of gale force were also reported in the easterly quadrants.

From the 13th to 15th a deep and slowly moving depression was off the American coast, which during that period was swept by strong westerly gales from Hatteras to Newfoundland; on the 16th the depression began to move rapidly eastward, reaching European waters by the 18th.

From the 14th to 16th there was a well-developed disturbance over the eastern section of the steamer lanes that reached its greatest intensity on the 15th.

On the 18th St. Johns, Newfoundland, was again near the center of a low and moderate gales were reported from vessels between the 30th and 40th parallels and 50th and 55th meridians. On the 19th heavy weather